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Catalytic oxidation of veratryl alcohol – a β -O-4 lignin model compound - to veratraldehyde

M. Melián Rodríguez^{*}, S. Saravanamurugan, S. Kegnæs, A. Riisager

Technical University of Denmark, Centre for Catalysis and Sustainable Chemistry, Department of Chemistry, Kemitorvet 207, DK-2800 Kgs. Lyngby, Denmark

*mayro@kemi.dtu.dk

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Lignin is the second most abundant natural polymer and represents 40% of the energy content in lignocellulosic biomass. It is viewed as the obvious candidate to serve as a renewable feedstock of basic aromatic chemicals. In lignocellulosic material the composition as well as the molecular weight and structure of the lignin differ from plant to plant (hardwood, softwood, grass etc.), impeding the developments on lignin valorization processes. However, three monolignol monomers p-coumaryl, coniferyl and sinapyl alcohol are common building blocks. They are connected with various linkages with the most common one being the β -O-4 linkage. Due to lignin complexity and variability, several simpler, low molecular weight lignin model compounds have been prompted in the study of lignin valorization [1-3]. The oxidation of veratryl alcohol to veratraldehyde is a benzylic oxidation representing the valorization of one of the β -O-4 model compounds of lignin. Since the product veratraldehyde is a useful flavorant and odorant the transformation has been comprehensively studied by both enzymatic and homogeneous catalyst systems [4-5].

In the present work we have prepared, characterized and examined the performance of heterogeneous catalysts with ruthenium or other transition metals supported on γ -alumina for the conversion of veratryl alcohol to veratraldehyde by aerobic oxidation in water (Fig. 1). Ru/Al₂O₃ showed superior catalytic activity yielding up to 89% veratraldehyde at 160 °C with 5 bar air pressure. Under prolonged reaction time the decarbonylated product veratrol formed but no increase in formation of veratric acid was observed. The Ru/Al₂O₃ catalyst could be reused in three consecutive reaction but with gradually lower yield [6].

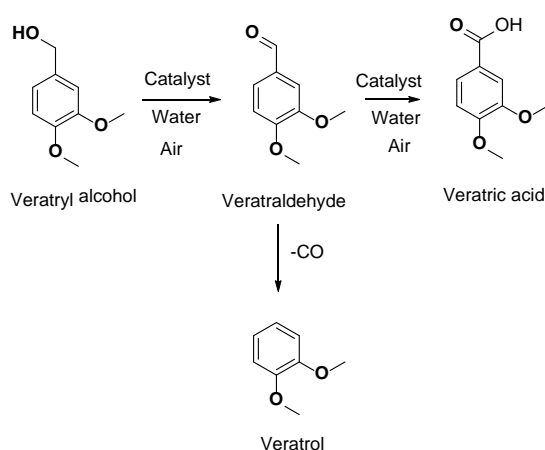


Fig. 1. Aqueous catalytic aerobic oxidation of veratryl alcohol.

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